Specification

Laparoscopic Lifter Apparatus and Method

Background of the Invention

1. Field of the Invention.

The present invention relates to surgical instruments for use during laparoscopic surgery. More particularly, the invention is directed to a surgical tool designed to gently manipulate and lift an organ thereby providing a means for allowing safe organ release from body cavity constraints and then, expedient organ removal.

2. Description of the Prior Art.

In order to perform laparoscopic surgery, surgical instruments are inserted through discrete openings in a patient's abdominal cavity eliminating a need for lengthy incisions accompanied by excess patient trauma and surgical complications. Most laparoscopic surgical instruments are designed to grasp tissue in opposing rough surfaced contact jaws terminating in irregular shapes not useful for organ manipulation and having the potential to cause organ perforation.

In U. S. Pat. No. 6,013,095, an endoscopic grasping tool has grasping pieces with tip end portions formed into inwardly bent beak like shapes designed to engage each other and grasp a foreign material.

U. S. Pat. No. 5,222,973 teaches a laparoscopic grasping tool with either forceps type jaws or hemostat type jaws, the jaws having serrated contact surfaces for a continuous jaw closure and increased grasping force in order to grasp tissue pedicles and other body structures.

U. S. Pat. No. 4,944,741 defines a laparoscopic surgical instrument having pivotal plate like jaws that selectively move toward and away from each other and are used to grasp vessels, tubes or stents during a laparoscopic procedure.

The above described inventions are not designed primarily for organ lifting and, therefore, have serious limitations when organ lifting is a primary concern. Teeth,

projections or ridges on grasping surfaces present obvious organ perforation hazards when instrument and organ contact occurs. The focus is on grasping and not on lifting.

The present invention is a laparoscopic surgical instrument designed to assist with laparoscopic surgical removal of organs, more specifically solid organs within a patient's abdominal cavity, in a simple and novel manner. The device has arms that are carefully and precisely extended and manipulated to gently lift, position and hold an organ, such as a spleen, so that necessary surgical procedures regarding the organ can be safely performed.

Summary of the Invention

A principal objective of the present invention is to provide a surgical instrument to assist in organ removal by providing a simple, useful and unique means for cleanly lifting and securely holding an organ during a laparoscopic surgical procedure.

Another principal objective of the present invention is to provide a laparoscopic surgical instrument that greatly benefits the removal of solid organs, such as a spleen or a kidney, having a narrow hilum where hilar dissection can be the most difficult part of a procedure.

Another objective of the present invention is to provide a laparoscopic lifting and holding instrument that can be manipulated to fit under an organ and gently lift the organ with minimal danger of organ damage and of subsequent operating field contamination.

Still another objective of the present invention is to markedly improve safety during laparoscopic procedures by decreasing operating time generally, and specifically by reducing the possibility of having to convert a laparoscopic procedure to an open procedure.

Yet, another objective of the present invention is to reduce surgical expenses by enhancing an operator's ability to do a procedure laparoscopically rather than through a large incision.

In brief, the present invention comprises a laparoscopic surg instrument, mainly a laparoscopic lifter apparatus which includes a manipulating handle used to retract or eject flexible, band like arms having blunt ends into or out of a rigid tubular rod, the arms assuming opposing arcuate shapes upon ejection from the tubular rod and the arm's blunt ends separated by a gap so easy laparoscopic instrument placement for safe organ lifting can occur. With the band like arms retracted into the rigid tubular rod, the laparoscopic organ elevator is inserted into a patient's abdominal cavity through a trocar sleeve. Reaching an organ site, the arms are extended outside a tubular rod distal end to an optimal length depending on organ size and spring into preformed arcuate shapes defining an open ended oval contour, the open blunt ends positioned to allow arm encirclement of the organ. Then the instrument is manipulated to slip the arms underneath the organ where the organ can rest on the arms and be lifted and held securely by an operator using a second handle secured to the tubular rod. Now the organ hilum is exposed and blood vessels within the hilum can be safely dissected, ligated, sutured and clipped or stapled. After a surgical procedure is completed, since the laparoscopic lifter apparatus is an instrument assembled by inserting a first handle, solid rod, arm section into a second handle, tubular rod section, these sections can be easily separated, sterilized and reassembled for future use.

A laparoscopic surgical instrument in accordance with the present invention can be used to markedly improve the safety, costs, operating time and patient open conversion rate in laparoscopic organ removal procedures for a variety of organs such as a spleen, liver, kidney and a uterus.

Brief Description of the Drawings

FIG. 1 is a plan view of an assembled laparoscopic lifter apparatus according to the present invention with arms associated therein shown in an extended, open position.

FIG. 2 is a longitudinal cross sectional view of an assembled laparoscopic lifter apparatus according to the present invention with arms associated therein shown in a retracted, closed position.

FIG. 3 is a perspective view of laparoscopic lifter apparatus arms according to the present invention commencing organ support.

FIG. 4 is a perspective view of laparoscopic lifter apparatus arms according to the present invention supporting and lifting an organ.

FIG. 5 is a plan view of a laparoscopic lifter apparatus tubular rod component.

FIG. 6 is a plan view of a laparoscopic lifter apparatus flexible arms component.

Detailed Description of the Drawings

Referring now to the drawings, **FIG. 1** is a plan view of a surgical instrument, mainly an assembled laparoscopic organ lifter apparatus **10** comprising a first manipulating bilateral handle **12**, a second holding and steadying bilateral handle **14**, a strong, rigid tubular rod **16** housing more than one band like flexible arm **18a, 18b**. Arms **18a, 18b** exit tubular rod **16** at a distal end **20** and assume oppositely disposed preformed arcuate shapes. The band like arms **18a, 18b** are mirror images of each other equal in length, width and depth, each arm **18a, 18b** having a width substantially three to four times greater than the depth and each arm **18a, 18b** ending in a blunt sphere **22**, the blunt spheres **22** spaced apart to define an opening **24.** Each arm **18a, 18b** has a uniform width throughout its length. After arms **18a, 18b** are extended to achieve a proper lifting position, a locking screw **26** retained in a threaded opening in an internally threaded ring **28** can be tightened to impinge on a solid rod **30** which is linked to arms **18a, 18b** preventing arm up down movement and rotation. When locking screw **28** is loosened, arms **18a, 18b** can be manipulated in unison a full 360 degrees by turning first handle **12** along a central axis. In addition, arms **18a, 18b** can be retracted into the tubular rod **16** distal end **20** by an operator using first handle **12** to pull a solid rod **30** out of a tubular rod

16 proximal end **32** as illustrated in **FIG. 2** showing a longitudinal cross sectional view of the assembled laparoscopic organ lifter **10**.

When a surgical procedure requires organ elevation, the laparoscopic organ lifter apparatus **10** is initially positioned as illustrated in **FIG. 2.** The organ lifter apparatus **10** tubular rod **16** has an outer diameter so designed to fit through a small incision, 10 to 11 millimeters in length. In the case of a spleen removal, after the spleen is laterally resected, the organ lifter apparatus **10** with arms **18a, 18b** retracted into tubular rod **20** as illustrated in **FIG. 2** is inserted through the incision into an abdominal cavity. Next, an operator thrusts first handle **12** toward the tubular rod **16** proximal end **32** in order to slide solid rod **30** along with arms **18a, 18b** through the tubular rod **16**, so that arms **18a, 18b** slowly eject from the tubular rod **16** distal end **20**. As arms **18a, 18b** are ejected, they gradually separate and assume arcuate shapes defining an open oval space **34**, a maximum distance between the arms **18a, 18b** increasing until full ejection occurs. At full ejection, blunt spheres **22** are separated by a distance of substantially 4 to 6 centimeters. The operator can stop the ejection at any point before full ejection to achieve optimal arms **18a, 18b** ejected length and arcuate shape for lifting and holding organs of a variety of shapes and sizes. When optimal arms **18a, 18b** ejection and positioning is achieved, locking screw **28** is tightened to impinge on rod **30** and the organ lifter apparatus **10** can lift and hold an organ so necessary surgical procedures can take place. Thus, the operator can slip the organ lifter apparatus **10** blunt spheres **22** opening **24** over an organ end, for example a spleen **36** end portion, and slide the organ lifter apparatus **10** with arms **18a, 18b** around the spleen and then down and under the spleen **36**, gently lifting the spleen **36** toward an anterior abdominal wall in order to expose the spleen **36** hilum **37** where blood vessels entering the spleen **36** can be safely dissected and sutured, ligated, clipped or stapled as shown in **FIGS. 3 and 4**. The spleen **36** rests on the thinnest or depth side of the extended arms **18a, 18b** and is held by pressure induced friction force. An operator uses second handle **14** to steady the organ elevator **10** and first handle **12** to rotate, retract

and extend arms **18a, 18b** to an infinite number of positions finding a correct arms **18a, 18b** opposing arcuate distance for optimum spleen **36** holding and lifting, the distance increasing as arms **18a, 18b** are extended and decreasing as arms **18a, 18b** are retracted.

Once the spleen **36** is divided from the hilum **37** and free from the abdominal cavity, the organ elevator **10** arms **18a, 18b** are fully extended to achieve a maximum blunt sphere **22** opening **24** needed to slide the organ lifter apparatus **10** away from the spleen **36**. At this point, arms **18a, 18b** are retracted into rigid tubular rod **16**, thereby diminishing the arms **18a, 18b** arcuate shapes until finally arms **18a, 18b** are fully enclosed in the tubular rod **16** and the blunt spheres **22** can be touching. At this time, the organ elevator **10** can be removed from the abdominal cavity.

The arms **18a, 18b** have widths just slightly less than the rigid tubular rod **16** inner diameter which allows the rigid tubular rod **16** to act as a guide for arms **18a, 18b** passing through tubular rod **16** and prevent arms **18a, 18b** crossover during retraction while also providing a strong, unbendable lifting device during a lifting and holding procedure.

The tubular rod **16** can have an outside diameter of substantially 10 millimeters to fit into an 11 millimeter incision. Arms **18a, 18b**, fully extended, can reach a distance of 12 to 18 centimeters when measured from the tubular rod **16** distal end **20** to arms **18a, 18b** blunt spheres **22**. If the organ lifter apparatus **10** is used to lift and hold a small organ such as a kidney, or a large organ such as a liver, an operator can retract or extend the arms **18a, 18b** thereby changing this distance. Arms **18a, 18b** have a width of substantially 6 to 8 millimeters and a depth of substantially 2 to 3 millimeters. The entire organ lifter apparatus **10** can be substantially 55 centimeters to 60 centimeters in length.

The entire organ lifter apparatus **10** can be constructed from 300 series stainless steel. The preformed arcuate arms **18a, 18b** can be made from 302 spring temper stainless steel with memory properties so that arms **18a, 18b** continually express the same arcuate shapes when extended after many repeated retractions into tubular rod **16**. For a disposable organ elevator **10**, plastic construction materials can be used. **FIGS. 5** and **6**

illustrate the laparoscopic organ lifter apparatus **10** components that comprise the organ lifter apparatus **10** when fully assembled and ready for use. **FIG. 5** depicts a tubular rod component **38** of the organ lifter apparatus **10** showing a hollow externally threaded coupler **40** adhered to a central hollow knob **42** securing tubular rod **16** substantially perpendicular to second bilateral handle **14**. A flexible arms component **44** as illustrated in **FIG. 6** is comprised of first bilateral handle **12** having a central element **46** for securing solid rod **30** substantially perpendicular to first bilateral handle **12**, the solid rod **30** terminating in connector piece **48** having slot means for griping arms **18a, 18b**. Rivet or screw means can also adjoin connector piece **48** to griping arms **18a, 18b**. The solid rod **30** passes through ring **28** housing locking screw **26**. The tubular rod component **38** and the flexible arms component **44** are assembled to comprise the organ elevator apparatus **10** when the flexible arms component **44** led by flexible arms **18a, 18b** is pushed through the tubular rod component **38** hollow externally threaded coupler **40** into the hollow knob **42** and then the tubular rod **16** so that arms **18a, 18b** extend out of the tubular rod **16** distal end **20** and assume arcuate shapes. The hollow externally threaded coupler **40** is inserted into the internally threaded ring **28** and affixed by screw means. Locking screw **26** is passes through ring **28** and is tightened to engage solid rod **30** when arms **18a, 18b** are extended to a desirable length and position for organ lifting and holding. For sterilizing purposes, it is advantageous to separate the organ lifter apparatus **10** into the two separate components **38, 44** where contaminates can easily be accessed and destroyed.

It should be understood that the organ lifter apparatus **10** is equally useful for removal procedures concerning a variety of organs in addition to spleen removal such as kidney, liver and gallbladder removal. Having described the invention, it is to be understood that many embodiments thereof will readily occur to those skilled in the art and, thus, it is not desired to limit the invention to an exact construction and operation as shown and described in the specification and drawings. Therefore, it is intended that all suitable modifications and equivalents fall within the scope and spirit of the invention.